Environment Canada
Environnement Canada

Environmental Conservation Service
Service de la Conservation de l'environnement

Inland Waters Directorate
Western and Northern Region

Direction générale des eaux intérieures
Région de l'Ouest et du Nord

MANITOBA-NORTHWESTERN ONTARIO DISTRICT

CONSTRUCTION, UPGRADING & MAINTENANCE

1985-1986 ANNUAL REPORT

REPORTED BY:

J.D. KENNING

CONSTRUCTION ENGINEER

R.E. COTE

CONSTRUCTION SUPERVISOR

DEPARTMENT OF THE ENVIRONMENT

INLAND WATERS DIRECTORATE

WATER RESOURCES BRANCH

ANNUAL CONSTRUCTION REPORT

1985-1986

CONSTRUCTION, UPGRADING
AND MAINTENANCE FOR
MANITOBA - N.W. ONTARIO DISTRICT

PREPARED BY:

J.D. Kenning & R. Cote
Water Resources Branch
Water Survey of Canada Division
Construction & Surveys

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
2.0	COST SHARING ARRANGEMENTS	3
	2.1 Cost Summary	5
3.0	CONSTRUCTION PROGRAM 85/86	6
	3.1 Construction Program Cost Summary	7
	3.2 Average Costs for 1985-86	8
	3.3 Definitions for Station Cost Breakdown	9
	3.4 Construction Cost Comparison 71/72 - 85/86	11
	3.5 Environmental Assessment	12
4.0	CONSTRUCTION PROJECT DESCRIPTIONS AND COSTS	14
	4.1 New Construction	15
	4.2 Upgrading	18
	4.3 Maintenance	33
	4.4 Project Cost Summary	53
	4.5 Construction Project Index	55
5.0	INSTALLATION OF INSTRUMENTATION AND REAL TIME EQUIPMENT	57
	5.1 Construction, Instrumentation and Telemetry Equipment Costs - DCP Program	57
	5.2 Instrumentation and Telemetry Equipment Costs - Construction Program	57
	5.3 Summary of Instrumentation and Telemetry Costs	57
	APPENDIX A	
	Description of Construction Methods and Procedures	68
	APPENDIX B	
	Salvaged Materials	73

1.0 INTRODUCTION

The Manitoba - N.W. Ontario District of the Water Resources Branch of Environment Canada carries out construction projects under formal agreements with the Province of Manitoba, the Province of Ontario and through arrangements with other agencies.

This report contains a brief description of each project, a cost breakout and cost summary for the 85-86 construction program. A description of construction methods and procedures, and a listing of salvaged materials are contained in the appendices.

Construction projects are separated into four categories:

(i) Construction - installation of structures at a new hydrometric station.

(ii) Upgrading - generally the erection of new structures at an existing hydrometric station for the purpose of improving the quality of data.

(iii) Maintenance - repairs to existing structures, including dismantling of gauging structures and returning the site to its original condition.

(iv) DCP Program - installation of data collection platforms (DCP's) at new and existing hydrometric stations.

The projects are constructed mainly by Winnipeg Construction Section staff, with some assistance from Hydrometric Surveys staff. Contractors are used for specialized services, such as excavating, hauling, providing redi-mix concrete and other tasks. All construction is carried out with due attention being given to "Minimum Standards for Design, Construction and Maintenance" developed for the District.

In addition to the construction, upgrading and maintenance of the structures at hydrometric gauging stations, the Water Resources Branch also installs the equipment and instruments required at the gauging stations. This work is normally carried out by the hydrometric staff of Water Survey. Their activities related to the installation of instrumentation and real time telemetry equipment are noted in Section 5.0 of this report.

An Environmental Assessment of all Construction projects in 85-86 was completed. The criteria for, and results of, this assessment are noted in section 3.5 of this report.

2.0 COST-SHARING ARRANGEMENTS

The cost-sharing arrangements between Canada and the Provincial agencies are governed by a Memorandum of Agreement for hydrometric surveys. Under the terms of these Agreements, each gauging station is classified Federal, Federal-Provincial or Provincial by a Coordinating Committee and formalized as Schedule A to the Agreements.

Determination of the construction program is a joint consultative process with the Province that results in a program which is a blend of both Federal and Provincial government priorities. Priority changes during the year, are reviewed with the Province.

Costs for maintenance, upgrading or new construction are shared in accordance with Schedule A to the Agreements. Stations classified as Federal are the cost responsibility of the Water Resources Branch of Canada (CWRB), stations classified as Federal-Provincial are cost shared equally and stations classified as Provincial are the cost responsibility of the Province.

Costs chargeable to the construction program are defined in the Memorandum of Agreement under Schedule B to the Agreement. In summary, direct costs, such as, salaries of construction personnel, field travel expenses, vehicle costs, construction materials, contract payments for services and depreciation of construction equipment are chargeable. Specialized equipment and/or instrumentation, such as real time telemetry equipment (DCP Program), is paid for by the party or parties requesting the service irrespective of the hydrometric station's cost share classification. Under the Agreement the cost of the basic water level recorder is the responsibility of the Water Resources Branch of Canada and therefore are not cost shared. Commencing in 1983-84, the cost of servomanometers is shared according to the station designation.

Appendix B of this report is for the record keeping of salvaged material from discontinued stations. This aids in the life cycle management of our construction items having significant value. The procedure for the identification, storage and re-use is described in Appendix B.

Construction carried out for other agencies is generally covered in a Memorandum of Understanding (MOU), where the formalized agreement specifies the financial responsibility for the construction costs.

2.1 COST SUMMARY

MANITOBA

Federal Costs

Construction Program	$62,125.97*
Recorders and Servomanometers	0.00
TOTAL	$62,125.97

Provincial Costs

Construction Program	$27,125.18**
Servomanometers	0.00
TOTAL	$27,125.18

DCP Program Costs

Construction Program	$36,847.37
Recorders and Servomanometers	32,500.00
Real Time Telemetry	101,442.00
TOTAL	$170,789.37

ONTARIO

Federal Costs

Construction Program	$11,124.21
TOTAL	$11,124.21

Other Agency

A.	Recorders and Servomanometers	$ 3,984.20
	Real Time Telemetry	23,712.00
	Meteorological Equipment	2,275.40
	TOTAL	$29,971.60
B.	A.E.C.L. Construction Program	$22,823.03
	TOTAL	$22,823.03
	TOTAL DISTRICT CAPITAL CONSTRUCTION PROGRAM	$323,959.36

* Includes $3,247.30 paid by DFO under separate M.O.U.
** Includes $3,920.77 paid by M.W.R.B. under separate M.O.U.

3.0 CONSTRUCTION PROGRAM 1985-86

Phase II of the District's long term construction program, which began in 1982-83 and consisted of upgrading look-in to walk-in type shelters and the insulation and electrification of stations, was again curtailed during 1985-86. No upgrading of look-in to walk-in type shelters was carried out while insulation and electrification were reduced to five and thirteen locations respectively.

Sixty-two projects were completed as part of the regular construction program and eleven as part of the DCP Program. Of the sixty-two projects, twenty-four were upgraded, thirty-six required maintenance of various nature and two new stations were established (A.E.C.L.). The total cost for the regular District Construction Program was $123,139.64 (excluding instrumentation).

Station upgrading consisted of construction of three walk-in shelters, insulating and electrifying two walk-in shelters, electrifying eleven shelters, constructing four concrete controls and extending telephone service to one location.

Station maintenance consisted mainly of repairing of functional wells, electrical repairs, repairing cableways, and dismantling gauging structures.

The 85-86 construction program was completed under the direction of the Construction Engineer, and the Construction Supervisor with assistance from one summer student, one four month term construction assistant, and Water Survey Division field surveys staff.

3.1 CONSTRUCTION PROGRAM COST SUMMARY

Manitoba Stations

	Federal	Fed.-Prov.	Provincial	Total
New Construction	-	-	-	-
Upgrading	20,540.82	11,849.84	5,397.73	37,788.39
Maintenance	26,069.11*	10,312.05	8,655.55**	45,036.71
V & E Depreciation	3,583.225	1,703.68	1,080.37	6,3678.30
Total	$50,193.18	$23,865.57	$15,133.65	$89,192.40

Ontario Stations

	Federal	A.E.C.L.	Total
New Construction	-	8,242.90	8,242.90
Upgrading	-	14,580.13	14,580.13
Maintenance	11,124.21	-	11,124.21
Total	$11,124.21	$22,823.03	$33,947.24

TOTAL CONSTRUCTION PROGRAM $123,139.64

V & E - Vehicle & equipment

* Includes $3,247.30 paid by DFO under separate M.O.U.
** Includes $3,920.77 paid by MWRB under separate M.O.U.

3.2 AVERAGE COSTS FOR 1985-86

Cableway

A 110 m span cable consisting of 19 mm 6 x 19 wire rope complete with 4.3 m high steel pipe A-frames with concrete anchors, aluminum sit-down cable car, platform and aircraft warning markers.

Materials		$6,800.00
Travel Expenses		800.00
Salaries		2,400.00
	Total	10,000.00

Servomanometer Shelters

Armco - 1625 mm square x 2440 mm high, insulated and panelled, set on concrete or timber base.

Materials		$1,740.00
Travel Expenses		340.00
Salaries		1,120.00
	Total	$3,200.00

Functional Installation

A 5 m long, 400 mm diameter CSP well with "California" type shelter generally strapped to bridge pile or pier.

Materials		$ 460.00
Travel Expenses		160.00
Salaries		515.00
	Total	$1,135.00

Instrumentation

Servomanometer	$4,250.00
A 71 Stevens Recorder	2,700.00
Telemark II (with encoder & battery charger)	2,400.00
Wire Weight Gauge	850.00
DCP System (complete with Memomark III battery and solar panel)	7,904.00

3.3 DEFINITIONS FOR STATION COST BREAKDOWN

Construction cost data is divided into eleven groups and is described briefly as:

Materials and Supplies	All materials supplied by Water Resources Branch for erection of specified structure.
Travel Expenses	Air fare (scheduled flights), meals, accommodation. Gas and oil used by construction vehicles.
Salaries	Wages of Water Resources Branch personnel.
Labour	Wages paid to other than Water Resources Branch personnel.
Rentals	Charges for rental of equipment used by Water Resources Branch personnel.
Contract Cost	Payment to a private contractor for supply of a service or completion of a construction project (includes cost of materials supplied by contractor).
Aircraft Charter	Use of non-scheduled aircraft flights.
Electrical	Wiring of shelter for power.
Hydro	Extension of electrical service to gauge shelter (Manitoba Hydro or Ontario Hydro).
Telephone	Extension of private line telephone service to gauge shelter.

Instrumentation	Servomanometer, type A recorder, telemarks and code-a-phone adapters, DCP's (not included in project costs, but included on cost summary Sections 5.1 and 2.1).

3.4 CONSTRUCTION COST COMPARISON 1971/72 - 85/86

AVERAGE INSTALLATION COST OF TYPICAL STRUCTURES

Fiscal	Bank		Servo-Shelter			Instrumentation	
Year	Installation	Cableway	Bally	Armco	Functional	A71	Servo
71-72	3711	3100	-	664	320		
72-73	4300	3300	-	700	370		
73-74	4817	3550	-	800	460		
74-75	6257	4000	-	995	510		
75-76	6809	5636	-	958	507		
76-77	7505	6100	3055	1232	595		
77-78*	3051	4243	3363	1943	617		
78-79	4206	-	3834	2335	690		
79-80	-	-	3958	2175	687	1925	2452
80-81	-	-	3553	2398	713	1833	2820
81-82	-	5500	4283	2389	918	2055	3131
82-83	9854	9137	4950	2580	954	2200	3800
83-84	-	9062	-	2797	1018	2200	3600
84-85	-	9550	-	3025	1075	2200	3800
85-86	-	10000	6750	3200	1135	2700	4250

3.5 ENVIRONMENTAL ASSESSMENT

In 1984 the District began formal environmental assessment following "The Environmental Assessment and Review Procedure for Inland Waters Directorate, Western and Northern Region, Work Plan Activities" which implements the Department of Environment's "Guideline on Procedures for Environmental Screening of Departmental Projects".

The purpose of the process is to ensure that the environmental effects of federal projects are assessed in relation to possible adverse effects upon the Environment. Thirteen criteria,

1. Clearing
2. Top soil removal
3. Culverting
4. Channel dredging
5. Weir construction
6. Rip rap placement
7. Herbicide usage
8. Stream in fill
9. Chemical preservatives
10. Bank excavation
11. Permafrost disturbance
12. Drainage
13. Drilling and blasting

were specificed as being conditions where environmental assessment was required.

The following prescreening form lists those locations on the 85-86 construction program where one or more of these criteria existed. It also notes the areas of potential impact of a project and what mitigative measures and consultations took place before project initiation.

PRESCREENING FORM

Inland Waters Directorate
Western & Northern Region

Branch / District IWD/WPG

Responsibility Centre Manager D. Kimmett

Fiscal Year 1985 - 1986

PROJECT DETAILS						CONCLUSION		
Location		Type of Work (a)	Components	Schedule		Potential Impact Area (b)	Miligative Measures (c)	Consultation
River/Lake	latitude/longitude			Start	Finish			
ASSINIBOINE RIVER	495209/972410	2	10	Aug	Sept	1 3	4	
GRAHAM CREEK	491550/1005945	3	5 6 10	July	Aug	3		
SNOWFLAKE CREEK	490117/983613	3	5 6 10	Aug	Sept	3		
PEMBINA RIVER	490153/981640	2	3	June	July	4		
PELICAN CREEK	502835/992905	2	6	July	Aug	4		
MANNES DRAIN	493714/972232	2	6 10	June	July	4		

a) 1. Research
2. Maintenance
3. New facility

b) 1. Ecological
2. Social
3. Aesthetic
4. No impact

c) 1. Design change
2. Location change
3. Schedule change
4. Other (specify)

Signature of RCM (sgd.) D. Kimmett

Date 1985-03-25

4.0 PROJECT DESCRIPTION AND COSTS

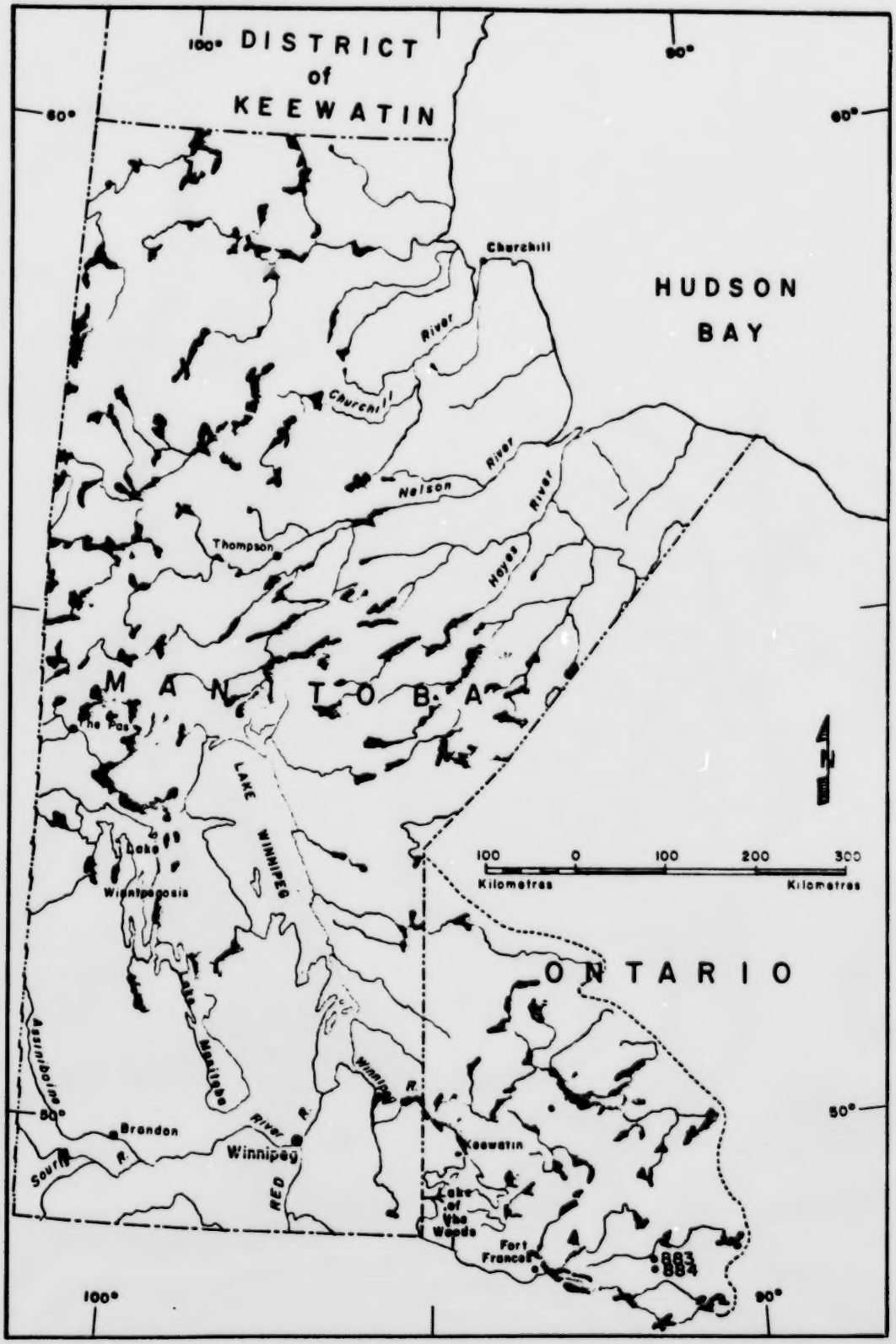
The following sections contain brief descriptions of the completed projects and associated cost data.

The sections contained herein are Construction, Upgradng and Maintenance. The definition of these are given on Page 1 in the introduction. Definitions for breakdown of cost data is given on Page 10.

The descriptions do not include the cost of construction or upgrading related to the installation of real time equipment. These costs combined with the purchase price of the instrumentation are detailed in Section 5 of this report.

Vehicle and equipment depreciation costs ($6,367.30) are not charged to individual projects but rather the group of projects as a whole (ie. Percentage to F., F-P, and P stations).

NEW CONSTRUCTION



NEW CONSTRUCTION

Project No. 883

Dashwa Lake - Upper North East Trib. near Atikokan - Federal 05PB019

Install gauge well and concrete control.

Description: Well and Shelter - 380 mm diameter, galvanized steel culvert, 3 m long anchored against bedrock with 6 mm cable and 2.5 m long timber walkway (Drg. N1). A steel plate shelter houses a float activated recorder.

Control - 230 mm wide reinforced concrete wall, 1.4 m high and 2.5 m long contains a 458 mm -120° V notch weir blade. Wall is anchored to bedrock.

Construction: Installation by District personnel on Crown land.

Construction Cost Data:		
	Materials and Supplies	$ 657.16
	Travel Expenses	981.29
	Rentals	227.04
	Labour	890.17
	Contract	240.00
	Salaries	1,758.00
	Total Project Cost	$4,753.66

Project No. 884

Dashwa Lake - Lower N.E. Trib. near Atikokan - Federal 05PB020

Install gauge well and concrete control.

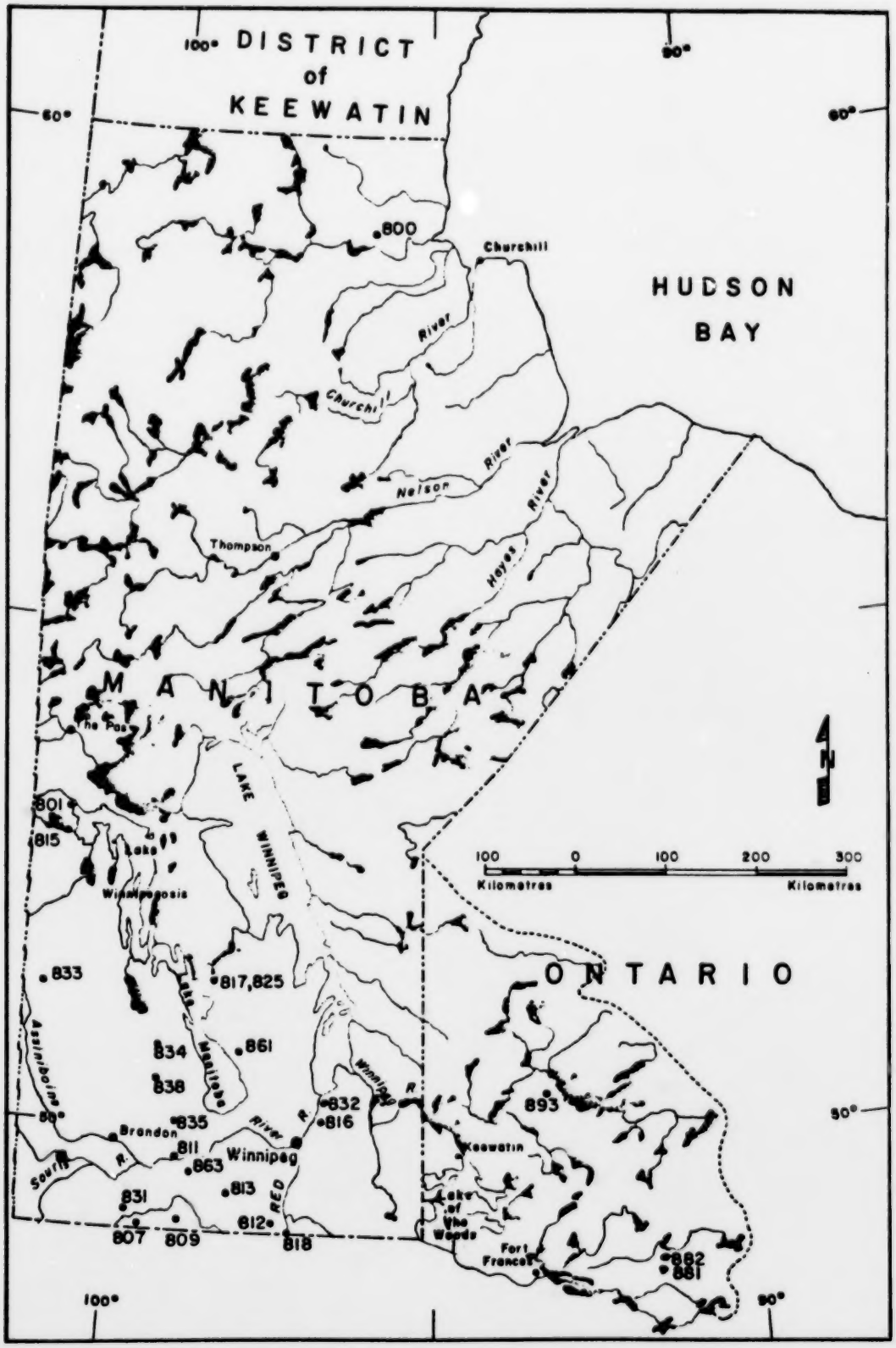
Description: Well and Shelter - 380 mm diameter, galvanized steel culvert, 2.5 m long set on bedrock and anchored by 3 sets of 6 mm diameter wire rope and 2.5 m long timer walkway (Drg. S1). A steel plate shelter houses a float activated recorder.

Control - 230 mm wide reinforced concrete wall, 1.25 m high and 3 m long contains a 458 mm - 90° V notch weir blade. Wall is anchored to bedrock.

Construction: Installation by District personnel on Crown land.

Construction Cost Data:		
	Materials and Supplies	$ 121.78
	Travel Expenses	903.28
	Rentals	227.03
	Labour	679.15
	Salaries	1,558.00
	Total Project Cost	$3,489.24

UPGRADING


DISTRICT of KEEWATIN
HUDSON BAY
MANITOBA
ONTARIO
Churchill
Churchill River
Nelson River
Hayes River
Thompson
Lake Winnipeg
Lake Manitoba
Lake of the Woods
Winnipeg
Brandon
Keewatin
Fort Frances
Kilometres
100 0 100 200 300
800
801
815
833
817,825
834
838
861
835
811
863
813
831
807
809
812
818
832
816
893
882
881
100°
90°
60°
50°

UPGRADING

Project No. 800

Seal River below Great Island - Federal 05GD001

Install gauge shelter.

Description:	A 1625 mm square by 2440 mm high Armco prefabricated metal building with R8 fibreglass insulation and 6 mm hard board panelling mounted on a timber base, supported by four 150 mm x 50 mm timber posts set 750 mm into ground.	
Construction:	Installation by District personnel on Crown property.	
Construction Cost Data:	Materials and Supplies	$1,590.42
	Travel Expenses	224.45
	Aircraft Charter	2,961.00
	Salaries	1,485.00
	Total Project Cost	$6,260.87

Project No. 801

Lake Winnipegosis at Dawson Bay - Federal 05LD002

Install electrical service and insulate gauge shelter.

Description:	Existing Armco shelter was insulated with R8 fibreglass and panelled with 6 mm hardboard. A 60 amp electrical service was installed.	
Construction:	Insulation and panelling completed by District personnel and electrical completed by Sevcenko Electric of Minitonas.	
Construction Cost Data:	Materials and Supplies	$ 184.15
	Travel Expenses	145.36
	Electrical	667.75
	Hydro	638.00
	Salaries	783.00
	Total Project Cost	$2,418.26

Project No. 807

Badger Creek near Cartwright - Federal 050A007

Insulate shelter and well.

Description:	Install 38 mm styrofoam insulation to interior of C.S.P. shelter and interior of C.S.P. well to a depth of 2.4 m.	
Construction:	Installation by District personnel on private property.	
Construction Cost Data:	Materials and Supplies	$ 70.00
	Travel Expenses	173.09
	Salaries	398.00
	Total Project Cost	$ 641.09

Project No. 809

Crystal Creek near Crystal City - Federal 050B006

Insulate shelter.

Description:	The existing Armco shelter was insulated with R8 fibreglass and panelled with 6 mm hardboard.	
Construction:	Installation by District personnel on provincial road allowance.	
Construction Cost Data:	Materials and Supplies	$ 158.63
	Travel Expenses	89.25
	Salaries	338.00
	Total Project Cost	$ 585.88

Project No. 811

Assiniboine River at Holland - Federal 05MH005

Install electrical service.

Description:	60 amp electrical service extended to existing metal recorder shelter.	
Construction:	Installation by Austin Electric of Austin, Manitoba.	
Construction Cost Data:	Travel Expenses	$ 37.43
	Electrical	434.00
	Salaries	280.00
	Total Project Cost	$ 751.43

Project No. 812

Buffalo Lake Channel near Altona - Federal - 050C025

Install removable metering rail.

Description:	A 3.4 m long by 0.8 m high removeable metering rail, constructed of 51 mm diameter aluminum pipe, was installed across two sections of concrete culverts. The rail is supported by two of three brackets attached permanently to concrete wall and spaced 3.4 m apart. The rail is stored as two pieces inside nearby Armco shelter.	
Construction:	Installation by District personnel on municipal road allowance.	
Construction Cost Data:	Materials and Supplies	$ 327.51
	Travel Expenses	120.91
	Salaries	353.00
	Total Project Cost	$ 801.42

Project No. 813

Boyne River near Roseile - Federal - 050F011

Install removable metering rail.

Description: A 4.0 m long by .8 m high removable metering rail constructed of 51 mm and 38 mm aluminum pipe was installed across the timber bridge dock. The rail is supported by two of six brackets permanently attached to the upstream side timber bridge girder spanning the river. These brackets are spaced at 4 m intervals. The rail is stored as 4 pieces in the station shelter.

Construction: Installation by District personnel on municipal road bridge.

Construction Cost Data:		
	Materials and Supplies	$ 385.21
	Travel Expenses	93.40
	Salaries	390.00
	Total Project Cost	$ 868.61

Project No. 815

Red Deer River near Mouth, Lake Winnipegosis - Federal 05LC004

Insulate and panel gauge shelter.

Description: Existing 1625 mm square by 2440 mm high Armco metal building insulated with R8 fibreglass and paneled with 6 mm hardboard.

Construction: Installation by District personnel.

Construction Cost Data:		
	Materials and Supplies	$ 149.15
	Travel Expenses	203.22
	Salaries	563.00
	Total Project Cost	$ 915.37

Project No. 816

Cooks Creek near East Selkirk - Federal 050J002

Insulate and panel gauge shelter.

Description:	Existing 1625 mm square by 2440 mm high Brytex metal building insulated with R8 fibreglass and panelled with 6 mm hardboard.	
Construction:	Installation by District personnel on private property.	
Construction Cost Data:	Materials and Supplies	$ 144.55
	Travel Expenses	110.15
	Salaries	360.00
	Total Project Cost	$ 614.70

Project No. 817

Lake St. Martin near Hilbre - Federal 05LM005

Insulate and panel gauge shelter, install 60 amp electrical service.

Description:	Existing 1625 mm square by 2440 mm high Brytex metal building insulated with R8 fibreglass and panelled with 6 mm hardboard. A 60 amp electrical service was installed.	
Construction:	Insulation by District personnel on private property. Electrical service installed by Ashern Electric of Ashern, Manitoba.	
Construction Cost Data:	Materials and Supplies	$ 162.83
	Travel Expenses	155.20
	Electrical	575.00
	Hydro	4,135.00
	Salaries	962.00
	Total Project Cost	$5,990.03

Project No. 818

Red River at Emerson - Federal - 050C001

Insulate concrete shelter.

Description:	Existing 1525 mm square by 2200 mm high concrete gauge shelter was insulated with 38 mm styrofoam insulation.	
Construction:	Installation by District personnel on municipal property.	
Construction Cost Data:	Materials and Supplies	$ 72.26
	Travel Expenses	155.90
	Salaries	465.00
	Total Project Cost	$ 693.16

Project No. 831

Pembina River near Killarney - Federal-Provincial - 050A008

Install electrical services.

Description:	60 amp hydro service extended to existing Armco gauge shelter.	
Construction:	Installation by Killarney Electric of Killarney, Manitoba.	
Construction Cost Data:	Travel Expenses	$ 138.66
	Electrical Contract	431.00
	Hydro	359.48
	Salaries	404.00
	Total Project Cost	$1,333.14

Project No. 831

Devils Creek near Libau - Federal-Provincial - 050J016

Repair electrical service

Description:	Repaired existing 30 amp hydro service on C.S.P. shelter by installing new service mast, meter socket and ground rod to existing 30 amp panel in preparation for hydro service to building in 1986-87.	
Construction:	Repairs by District personnel on municipal property.	
Construction Cost Data:	Materials and Supplies	$ 128.04
	Travel Expenses	125.58
	Salaries	525.00
	Total Project Cost	$ 778.62

Project No. 833

Shell River near Roblin - Federal-Provincial - 05MD007

Install electrical services

Description:	30 amp electrical service was extended to functional well attached to bridge pier.	
Construction:	Electrical service installed by District personnel and Kostick Electric of Roblin, Manitoba.	
Construction Cost Data:	Materials and Supplies	$ 177.78
	Travel Expenses	216.64
	Electrical	395.65
	Hydro	1,500.00
	Salaries	979.00
	Total Project Cost	$3,269.07

Project No. 834

McKinnon Creek near McCreary - Federal-Provincial - 05LJ027

Install electrical serivces

Description:	30 amp hydro service extended to functional gauge well located on traffic bridge.	
Construction:	Installation by District personnel and Lundy Electric Ltd. of McCreary, Manitoba, on municipal right-of-way.	
Construction Cost Data:	Materials and Supplies	$ 160.13
	Travel Expenses	152.70
	Electrical	331.50
	Hydro	48.00
	Salaries	870.00
	Total Project Cost	$1,562.33

Project No. 835

Pine Creek near Pine Creek Station - Federal-Provincial 05LL007

Install electrical serivces

Description:	30 amp hydro service extended to functional gauge well located on traffic bridge.	
Construction:	Electrical service installed by District personnel and Austin Electric.	
Construction Cost Data:	Materials and Supplies	$ 206.80
	Travel Expenses	198.47
	Electrical	180.50
	Hydro	230.00
	Salaries	547.00
	Total Project Cost	$1,362.77

Project No. 836

Mink Creek near Ethelbert - Federal-Provincial 05LJ019

Install electrical services

Description:	Hydro service pole, ground rod and cable buried to traffic bridge in preparation for extension of 30 amp hydro service to functional gauge well located on traffic bridge.	
Construction:	Installation by District personnel on Dept. of Highways right-of-way.	
Construction Cost Data:	Materials and Supplies	$ 210.54
	Travel Expenses	100.02
	Salaries	285.00
	Total Project Cost	$ 595.56

Project No. 838

Pelican Creek near Bernie - Federal-Provincial 05LL027

Install electrical serivces

Description:	30 amp hydro service extended to functional gauge well located on traffic bridge.	
Construction:	Installation by District personnel and Lundy Electrical Services of McCreary, Manitoba.	
Construction Cost Data:	Materials and Supplies	$ 180.22
	Travel Expenses	167.95
	Electrical	331.50
	Hydro	69.00
	Salaries	720.00
	Total Project Cost	$1,468.67

Project No. 843

Pine Creek near Melbourne - Federal-Provincial 05LL014

Insulate gauge well.

Description:	A wood frame enclosure containing 2 layers of 1-1/2" thick styrofoam insulation was constructed around existing 48" diameter CSP guage well. The enclosure extended vertically from bottom of Armco shelter to ground level of left bank.	
Construction:	Installation by District personnel on Provincial road allowance.	
Construction Cost Data:	Materials and Supplies	$ 274.53
	Travel Expenses	269.15
	Salaries	936.00
	Total Project Cost	$1,479.68

Project No. 861

Burnt Lake Drain near Lundar - Provincial - 05LN003

Install electrical services

Description:	30 amp hydro service extended to functional gauge well located on traffic bridge.	
Construction:	Installation by District personnel on Dept. of Highways right of way.	
Construction Cost Data:	Materials and Supplies	$ 102.43
	Travel Expenses	100.65
	Hydro	227.00
	Electrical	200.00
	Salaries	665.00
	Total Project Cost	$1,295.08

Project No. 863

Boyne River near Treherne - Provincial 050F010

Install electrical services

Description:	30 amp hydro service extended to functional gauge well located on traffic bridge.	
Construction:	Electrical service installed by District personnel and by Notre Dame electric.	
Construction Cost Data:	Materials and Supplies	$ 189.48
	Travel Expenses	228.66
	Hydro	370.00
	Electrical	525.00
	Salaries	1,166.00
	Total Project Cost	$2,479.14

Project No. 868

Assiniboine River near Holland - Federal - 05MH005

Telephone service.

Description:	Private line telephone service with series 500 telephone was installed.	
Construction:	Service by Manitoba Telephone System.	
Construction Cost Data:	Telephone	$1,273.51
	Salaries	350.00
	Total Project Cost	$1,623.51

Project No. 881

Eye River near Coulson Lake (HS4) - Federal 05PB022

Excavate rock from channel.

Description:	Large boulders and loose fractured rock were excavated from site of proposed streamflow control. A 1 m x 1 m platform constructed of Armco planking and angle iron was attached to building base.	
Construction:	Major excavation by Stan Bates Construction of Atikokan with loose rock removal and platform construction by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 227.23
	Travel Expenses	639.34
	Labour	98.50
	Contracts	740.00
	Salaries	1,380.00
	Total Project Cost	$3,085.07

Project No. 882

Eye River at Outlet Hardtack Lake - Federal 05PB021

Construct concrete control structure and metering walkway.

Description:

Metering Walkway - Prefabricated, 1 m wide by 12 m long walkway, constructed of 65 mm x 65 mm x 5 mm angle iron and 4 m by .25 m armco metal planking decking supported x .6 m x 1.3 m x 1.3 m high reinforced concrete footings. Two 1 m x 12 m long trusses (3-4 m sections bolted together) constructed of 51 mm x 51 mm x 3 mm tube for upper and lower chords. Spreaders are constructed of 25 mm x 25 mm x 3 mm galvanized metal. Angle iron supports at 6' intervals provide support for Armco planking deck.

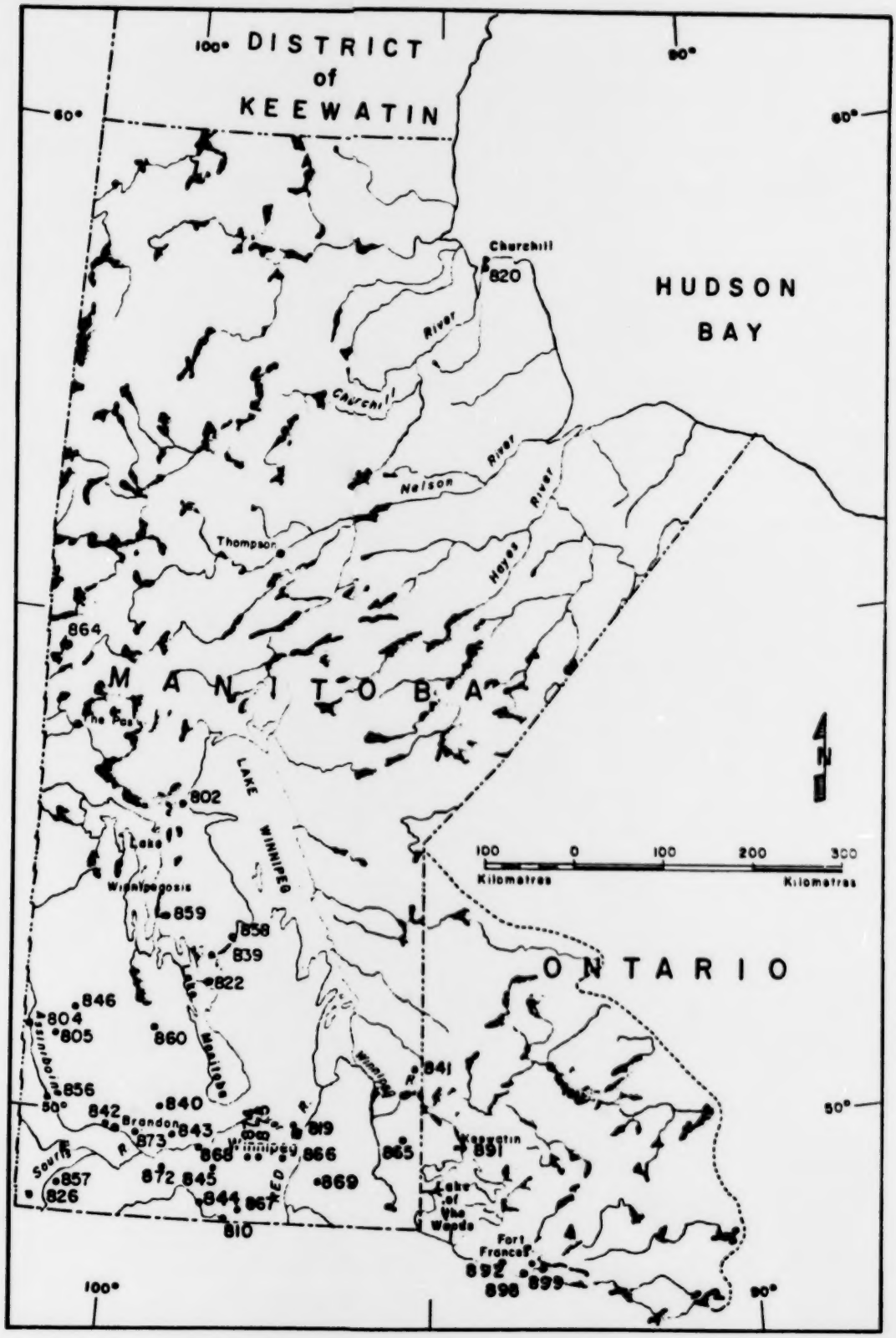
Concrete Control - A 300 mm thick by 6 meter wide by 1.5 meter high reinforced concrete wall with 0.9 m 120° V-notch weir blade was constructed across the main channel. An additional 13 meter long corrugated metal cut-off wall was constructed across the roadway and tied into bedrock on right bank. This wall was backfilled and roadway raised to top of cut-off wall. Upstream and downstream sides of right bank, at the control, were rip rapped with sandbags containing sand and cement mix.

Construction Installation by District personnel.

Construction Cost Data:

Materials and Supplies	$1,049.79
Travel Expenses	1,921.32
Labour	1,189.45
Contracts	2,454.50
Salaries	4,880.00
Total Project Cost	$11,495.06

MAINTENANCE



MAINTENANCE

Project No. 802

Dauphin River near Anama Bay - Federal 05LM006

Install aluminum calbecar and tighten aircraft marker cable.

Description:	Aluminum sit-down cablecar was installed replacing the old wood sit-down car. 13 mm diameter 6 x 19 wire rope aircraft marker cable was retightened and existing 19 mm x 1.5 m earth anchors were replaced with two 19 mm x 1.85 m earth anchors.	
Construction	Installation by District personnel on crown land.	
Construction Cost Data:	Materials and Supplies	$1,604.89
	Travel Expenses	245.16
	Salaries	450.00
	Total Project Cost	$2,300.05

Project No. 804

Assiniboine River near Russell - Federal 05MB001

Repair intake pipes.

Description:	Approximately 2 m length was removed from upper intake pipe. In bank pipe was partially excavated and straightened. All intakes were pump flushed.	
Construction	Repairs by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 25.30
	Travel Expenses	119.61
	Salaries	300.00
	Total Project Cost	$ 444.91

Project No. 805

Birdtail Creek near Birtle - Federal 05ME003

Install flushing system on intake pipes.

Description:	A flushing system consisting of 51 mm gate values and riser pipes were installed on 2 intermediate level intake pipes.	
Construction	Installation by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 216.00
	Travel Expenses	234.51
	Salaries	750.00
	Total Project Cost	$1,200.51

Project No. 806

Graham Creek near Melita - Federal 05NF008

Install guy wire to electrical service pole.

Description:	9 m x 6 mm cable tie back was installed to anchor existing 150 mm square service pole. A guy wire protector was installed on bottom section of the cable.	
Construction	Installation by District personnel on Dept. of Highways right of way.	
Construction Cost Data:	Materials and Supplies	$ 47.26
	Travel Expenses	212.60
	Salaries	195.00
	Total Project Cost	$ 454.86

Project No. 810

Pembina River at Windygates - Federal 05QB007

Increase size of L.B. anchor, install access culvert and gravel road.

Description:	Anchor - Existing 1.2 m x 1.2 m x 0.9 m deep concrete anchor was increased to 1.8 m x 1.8 m x 1.1 m deep using reinforcing steel anchored and grouted into existing block. Concrete poured to enlarge the anchor. Culvert - 460 mm diameter by 6.7 m long culvert was intalled across access road, covered with soil and gravelled.	
Construction	Installation by District personnel on private property.	
Construction Cost Data:	Materials and Supplies	$ 317.47
	Travel Expenses	465.24
	Contract	250.00
	Salaries	1,323.00
	Total Project Cost	$2,355.71

NOTE: Culverts were salvaged from Devils Creek near Libau (05OJ016) and Vermillion River near Dauphin (05LJ046).

Project No. 819

Omands Creek near Brookside Cemetery - Federal 05MJ008

Relocate functional well.

Description:	Moved existing 4.0 m long, 460 mm diameter CSP well with "california" shelter and float activated recorder from bridge on Notre Dame ave. New location is on bridge in Brookside Cemetery, upstream of old site.	
Construction	Relocation by District personnel on City of Winnipeg, Parks and Recreation land.	
Construction Cost Data:	Materials and Supplies	$ 62.30
	Salaries	540.00
	Total Project Cost	$ 602.30

NOTE: Paid by Department of Transport under Memorandum of Understanding dated April 4, 1985.

Project No. 820

Churchill Tidal Gauge - Federal

Repair gauge shelter.

Description:	Interior shelving, door, hardware and weather stripping of shelter were replaced.	
Construction	Installation by District personnel on harbour's board property.	
Construction Cost Data:	Materials and Supplies	$ 514.58
	Travel Expenses	1,224.72
	Rentals	158.00
	Salaries	1,350.00
	Total Project Cost	$3,247.30

NOTE: Paid by Department of Fisheries and Oceans under a Memorandum of Understanding dated April 3, 1985.

Project No. 821

Storage Garage

Construct storage garage and install electrical services.

Description:	A 7.3 m x 7.3 m x 2.4 m high wood frame structure, with 4.9 m x 2.1 m overhead door was constructed on a 100 mm x 300 mm timber base filled with compacted crushed stone. A 100 amp electrical service was installed.	
Construction	Construction by District personnel.	
Construction Cost Data:	Materials and Supplies	$4,060.42
	Electrical	572.00
	Rentals	150.00
	Salaries	3,772.00
	Total Project Cost	$8,554.42

Project No. 822

Lake Manitoba at Steeprock - Federal 05LK002

Replace gauge shelter.

Description:	Existing Armco shelter was removed from wharf due to wharf repairs. A 1625 m square Armco shelter, insulated with fibreglass and panelled with 6 mm hardboard, on a 150 mm x 300 mm timber base, was set on reconstructed wharf deck. Telephone and 50 amp electrical services were installed.	
Construction	Replacement by District personnel. Electrical by Ashern Electric of Ashern, Manitoba.	
Construction Cost Data:	Materials and Supplies	$2,470.71
	Travel Expenses	597.09
	Electrical	595.00
	Hydro	462.30
	Salaries	2,479.00
	Total Project Cost	$6,604.10

Project No. 826

Jackson Creek near Melita - Federal 05NF015

Install guy wire to electrical service pole.

Description:	12 m long by 6 mm cable tie back was installed from wingwall to existing 150 mm square service pole. A guy wire protector and 9 mm x 152 mm turnbuckle.	
Construction	Installation by District personnel on Dept. of Highways right of way.	
Construction Cost Data:	Materials and Supplies	$ 48.20
	Travel Expenses	61.75
	Salaries	195.00
	Total Project Cost	$ 304.95

Project No. 839

Fairford River near Fairford - Federal-Provincial 05LM001

Replace cable car.

Description:	Sit down steel plywood cable car was replaced by sit down aluminum cable car.	
Construction	Replacement by District personnel.	
Construction Cost Data:	Materials and Supplies	$1,562.51
	Travel Expenses	50.83
	Salaries	180.00
	Total Project Cost	$1,793.34

Project No. 840

Whitemud River above Neepawa Reservoir- Federal-Provincial 05LL013

Install gauge well and shelter.

Description:	500 mm diameter by 3.3 meter long galvanized corrugated steel pipe attached to concrete wingwall with metal straps and concrete anchors. A steel "california" shelter houses a float activated recorder.	
Construction	By District personnel on Municipal right of way.	
Construction Cost Data:	Materials and Supplies	$ 256.96
	Travel Expenses	293.55
	Salaries	780.00
	Total Project Cost	$1,330.51

Project No. 841

Bird River at Outlet of Bird Lake- Federal-Provincial 05PJ001

Replace functional well.

Description:	Existing 610 mm diameter culvert removed and replaced with 460 mm diameter culvert 3.2 m long.	
Construction	Work completed by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 20.78
	Travel Expenses	58.50
	Salaries	405.00
	Total Project Cost	$ 484.28

NOTE: Culvert re-used from Fishing River near Fork River (05LJ015).

Project No. 842

Assiniboine River near Brandon - Federal-Provincial 05MH013

Gravel access trail.

Description:	Spread gravel along 40 m of access trail to gauging station.	
Construction	Gravel spread by Cummings and Dobie of Brandon, Manitoba.	
Construction Cost Data:	Materials and Supplies	$ 141.80
	Travel Expenses	88.98
	Salaries	90.00
	Total Project Cost	$ 320.78

Project No. 844

Mary Jane Reservoir near La Riviere Federal - Provincial 050B014

Replace recorder shelter.

Description:	Removed wooden shelter and installed steel plate shelter on existing piping.	
Construction	Installation by District personnel on municipal property.	
Construction Cost Data:	Materials and Supplies	$ 150.00
	Travel Expenses	64.60
	Salaries	135.00
	Total Project Cost	$ 349.60

Project No. 845

Roseisle Creek near Roseile - Federal - Provincial 050F009

Install pyrotenax heat tape.

Description:	Heat tape D/RS22/36/335/110/14T installed in lower intake pipe.	
Construction	Installation by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 312.54
	Travel Expenses	204.69
	Salaries	300.00
	Total Project Cost	$ 817.23

Project No. 846

Pleasant Valley Creek near Grandview - Federal - Provincial 05LJ031

Replace main cable.

Description:	Existing wire rope with Flemish rolled eyes on each end was replaced with 19 mm, 6 x 19 fibre core wire rope with Flemish rolled eye on one end and cable clip connection on other.	
Construction	Replacement by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 18.41
	Travel Expenses	143.42
	Salaries	375.00
	Total Project Cost	$ 536.83

NOTE: Exchange on wire rope resulted in no cost for rope.

Project No. 856

Assiniboine River near Miniota - Federal - Provincial 05ME006

Install cableway platform.

Description:	A 1.2 m x 1.8 m x 2.2 m high Armco grating platform with 65 mm x 65 mm x 5 mm legs was anchored in concrete footings 0.6 m deep.	
Construction	Installation by District personnel on municipal right-of-way.	
Construction Cost Data:	Materials and Supplies	$ 75.48
	Travel Expenses	64.02
	Salaries	359.00
	Total Project Cost	$ 498.50

Project No. 857

Medora Creek near Napinka - Federal - Provincial 05MG020

Replace gauge well and shelter.

Description:	380 mm diameter galvanized corrugated steel pipe by 4.6 m long attached to downstream side of concrete centre bridge pier with metal straps and concrete anchors. A steel "California" shelter houses a float activated recorder. Damaged corrugated well and shelter were removed from upstream side of traffic bridge.	
Construction	Replacement by District personnel on Provincial right of way.	
Construction Cost Data:	Materials and Supplies	$ 292.58
	Travel Expenses	275.14
	Salaries	390.00
	Total Project Cost	$ 957.72

Project No. 858

Partridge Creek near St.Martin - Federal - Provincial - 05LM002

Remove gauge shelter and install functional well.

Description:	380 mm diameter, 16 gauge galvanized, painted black, corrugated steel pipe by 3.7 m long was attached to centre bridge pier with metal straps. A steel "California" shelter houses a float activated recorder. A 1625 mm square Brytex building was removed from site and relocated to Waterhen Lake.	
Construction	Installation by District personnel on L.G.D. Road.	
Construction Cost Data:	Materials and Supplies	$ 186.60
	Travel Expenses	149.66
	Salaries	450.00
	Total Project Cost	$ 786.26

NOTE: (i) Culvert salvaged from Jordan Creek near Plumas (05LL008).
(ii) Salvaged Material - 1625 mm x 1625 mm x 2440 mm Brytex building

Project No. 859

Waterhen Lake at Skowman - Federal - Provincial - 05LM008

Replace CSP shelter with Butler shelter.

Description:	Moved existing CSP shelter from site and replaced it with a 1625 mm square x 2440 mm high Butler (Pacemaker) steel shelter, mounted on a 150 x 150 mm timber base and anchored with galvanized steel signposts driven into soil.	
Construction	Installation by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 38.32
	Travel Expenses	131.12
	Salaries	450.00
	Total Project Cost	$ 619.44

NOTE: (i) Shelter salvaged from Partridge Creek near St.Martin (05LM002)
(ii) Salvaged material - 1370 mm dia CSP shelter.

Project No. 860

Turtle River near Laurier - Federal - Provincial - 05LJ007

Replace cablecar.

Description:	Replaced wooden type cablecar with aluminum sit down car, complete with 10" sheaves.	
Construction	Installation by District personnel.	
Construction Cost Data:	Materials and Supplies	$1,572.56
	Travel Expenses	50.00
	Salaries	195.00
	Total Project Cost	$1,817.56

Project No. 864

Manistikwan Lake near Flin Flon - Federal - Provincial - 05KG006

Relocate funtional well.

Description:	Existing 500 mm diameter by 2.5 m long 16 gauge galvanized steel pipe gauge well was shortened to 2 m and anchored with 3 angle iron posts.	
Construction	Work completed by District personnel on Crown land.	
Construction Cost Data:	Materials and Supplies	$ 54.69
	Travel Expenses	356.35
	Salaries	540.00
	Total Project Cost	$ 951.04

Project No. 865

Whiteshell River at Outlet of Jessica Lake - Provincial - 05PG001

Replace functional well and repair electrical.

Description:	Existing 600 mm diameter culvert removed and replaced with 460 diameter by 2.5 m long culvert. Existing 30 amp hydro service line from pole to recorder replaced with new cable and conduit. Safety railing installed on walkway.	
Construction	Work completed by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 228.34
	Travel Expenses	237.27
	Salaries	788.00
	Total Project Cost	$1,253.61

Project No. 866

Mannes Drain near Sanford - Provincial - 050G010

Alter crest elevation of sheet pile weir.

Description:	Crest of existing 14 gauge corrugated sheet pile weir was raised 300 mm by bolting 600 mm long corrugated sheets to existing sheet piles. The left bank wall was extended 1.8 m and right bank wall extended 6 m using 14 gauge corrugated metal sheets. Additional 100 mm limestone rip rap was placed upstream and downstream of elevated crest.	
Construction	Alterations completed by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 627.58
	Travel Expenses	477.59
	Contract	735.60
	Salaries	2,080.00
	Total Project Cost	$3,920.77

NOTE: Paid under Memorandum of Understanding with Manitoba Water Resources Branch.

Project No. 867

Deadhorse Creek near Morden - Provincial - 050C015

Replace recorder shelter.

Description:	Existing plywood recorder shelter was replaced with steel plate recorder shelter.	
Construction	Replacement by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 133.00
	Travel Expenses	75.97
	Salaries	300.00
	Total Project Cost	$ 508.97

Project No. 869

Joubert Creek near St.Pierre Jolys - Provincial - 050E007

Relocate functional well.

Description:	Existing 380 mm diameter by 4.9 m long stilling well was relocated from easterly pile bent to the westerly pile bent.	
Construction	Relocation by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 88.80
	Travel Expenses	74.02
	Rentals	40.00
	Salaries	375.00
	Total Project Cost	$ 577.82

Project No. 872

Oxtail Creek near Glenboro - Provincial - 05MH014

Relocate functional well.

Description:	Existing functional gauge well relocated one mile downstream due to reconstruction of bridge at existing location.	
Construction	Relocation by District personnel.	
Construction Cost Data:	Travel Expenses	$ 35.31
	Salaries	420.00
	Total Project Cost	$ 455.31

Project No. 873

Willow Creek near Chater - Provincial - 05MH011

Replace recorder shelter.

Description:	Existing plywood recorder shelter was replaced with steel plate recorder shelter.	
Construction	Replacement by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 125.80
	Travel Expenses	35.31
	Salaries	210.00
	Total Project Cost	$ 370.31

Project No. 874

Elm Creek Channel No. 2 near Elm Creek - Provincial - 050G005

Repair gauge well.

Description:	Existing gauge well was straightened and refastened to bridge. Damage was caused by ice during runoff.	
Construction	Repairs by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 109.36
	Travel Expenses	50.00
	Salaries	203.00
	Total Project Cost	$ 362.36

Project No. 875

Elm Creek Channel No. 3 near Elm Creek - Provincial - 050G006

Repair gauge well.

Description:	Damaged gauge well was straightened and refastened to bridge. Damage was caused by heavy farm equipment.	
Construction	Repairs by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 32.36
	Travel Expenses	50.00
	Salaries	173.00
	Total Project Cost	$ 255.36

Project No. 891

Lake of the Woods at Eastern Outlet - Federal - 05PE006

Repairs to cableway.

Description:	Existing timber A-frame was replaced with a 1.9 m high 100 mm steel pipe A-frame set on concrete footings.	
Construction	Work performed by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 680.10
	Travel Expenses	103.20
	Salaries	810.00
	Total Project Cost	$1,593.30

Project No. 892

Sturgeon River near Barwick, Ontario - Federal - 05PC010

Relocate funtional well.

Description:	Existing 380 mm diameter by 5.8m long gauge well was moved and attached to left bank bridge pile.	
Construction	Work completed by District personnel.	
Construction Cost Data:	Travel Expenses	$ 174.39
	Salaries	660.00
	Total Project Cost	$ 834.39

Project No. 893

Cedar River below Wabaskang Lake - Federal 05QE008

Remove existing Armco shelter and cableway and erect Bally building.

Description:	Existing 1625 mm square by 2440 high Armco shelter dismantled and removed from site. Existing 32 meter span cableway was dismantled to accomodate construction of traffic bridge at the site. A 1830 mm square by 2130 mm high Bally insulated shelter was erected 50 meters upstream of original site and recording equipment installed.	
Construction	Installation by District personnel on Crown property.	
Construction Cost Data:	Materials and Supplies	$3,807.32
	Travel Expenses	565.15
	Salaries	1,365.00
	Total Project Cost	$5,737.47

NOTE: $2,900 paid by Boise Cascade for removal of cableway and shelter.

Project No. 897

Rainy Lake at Fort Frances - Federal 05PB007

Minor electrical repairs.

Description:	Refasten electrical line and protective cover on service pole.	
Construction	Work completed by District personnel.	
Construction Cost Data:	Materials and Supplies	$ 62.00
	Travel Expenses	65.09
	Salaries	75.00
	Total Project Cost	$ 202.09

Project No. 898

Rainy River at Fort Frances, Ontario - Federal 05PC017

Dismantle cableway.

Description:	Existing 287 m span cableway and aircraft marker cable were removed from site and 200 mm square timber A-frames 3.1 m and 3.7 m high were dismantled.	
Construction	Dismantled by District personnel and Mutz Brothers Ltd. of Fort Frances on property of C. Wilson.	
Construction Cost Data:	Materials and Supplies	$ 67.71
	Travel Expenses	556.25
	Contracts	625.00
	Salaries	1,508.00
	Total Project Cost	$2,756.96

4.4 PROJECT COST SUMMARY REGULAR CONSTRUCTION PROGRAM

MANITOBA

Federal Stations

Material and Supplies	$12,611.84
Travel Expenses	4,669.04
Salaries	17,731.00
Aircraft	2,961.00
Rentals	308.00
Electrical	2,843.75
Hydro	5,235.30
Contracts	250.00
Vehicle and Equipment Depreciation	3,583.25
Total Federal Cost	$50,193.18

Federal-Provincial Stations

Materials and Supplies	$5,966.58
Travel Expenses	2,943.68
Salaries	9,375.00
Hydro	2,206.48
Electrical	1,670.15
Vehicle and Equipment Depreciation	1,703.68
Total Federal-Provincial Cost	$23,865.57

Provincial Stations

Materials and Supplies	$1,691.04
Travel Expenses	1,721.13
Salaries	7,270.00
Rentals	40.00
Hydro	752.00
Electrical	370.00
Contracts	935.60
M.T.S.	1,273.51
Vehicle and Equipment Depreciation	1,080.37
Total Provincial Cost	$15,133.65

TOTAL MANITOBA	$89,192.40

ONTARIO

Federal Stations

Materials and Supplies	$4,617.13
Travel Expenses	1,464.08
Salaries	4,418.00
Contracts	625.00
Total Federal Cost	$11,124.21

Atomic Energy of Canada Ltd.

Materials and Supplies	$2,055.96
Travel Expenses	4,445.23
Salaries	9,576.00
Labour	2,857.27
Rentals	454.07
Contracts	3,434.50
Total A.E.C.L. Cost	22,823.03
TOTAL ONTARIO	$33,947.24
TOTAL CONSTRUCTION	$123,139.64

4.5 CONSTRUCTION PROJECT INDEX

Project	Project No.	Page
Assiniboine River near Brandon	842	41
Assiniboine River near Holland	811,868	22, 30
Assiniboine River near Miniota	856	43
Assiniboine River near Russell	804	35
Badger Creek near Cartwright	807	21
Bird River outlet of Bird Lake	841	41
Birdtail Creek near Birtle	805	36
Boyne River near Roseisle	813	23
Boyne River near Treherne	863	30
Buffalo Lake Channel near Altona	812	22
Burnt Lake Drain near Lundar	861	29
Cedar River below Wabaskang Lake	893	51
Churchill River below Fidler Lake	854	63
Churchill Tidal Station	820	38
Cooks Creek near East Selkirk	816	24
Crystal Creek near Crystal City	809	21
Dashwa Lake - Lower N.E. Trib near Atikokan	884	17
Dashwa Lake - Upper N.E. Trib. near Atikokan	883	17
Dauphin River at Anama Bay	802	35
Deadhorse Creek near Morden	867	47
Devils Creek near Libau	832	26
Elm Creek Channel #2 near Elm Creek	874	49
Elm Creek Channel #3 near Elm Creek	875	49
Eye River near Coulson Lake (HS4)	881	31
Eye River near Hardtack Lake (HS5)	882	32
Fairford River near Fairford	839	40
Family Lake at Little Grand Rapids	847	60
Graham Creek near Melita	806	36
Jackson Creek near Melita	826	39
Joubert Creek at St. Pierre - Jolys	869	48
Lake Manitoba at Steeprock	822	39

Project	Project No.	Page
Lake Winnipegosis at Dawson Bay	801	20
Lake of the Woods at Eastern Outlet	891	50
Lake St.Martin near Hilbre	817	24
McKinnon Creek near McCreary	834	27
Manistikwan Lake near Flin Flon	864	46
Mannes Drain near Sanford	866	47
Mary Jane Reservoir near LaRiviere	844	42
Medora Creek near Napinka	857	44
Mink Creek near Ethelbert	836	28
Omands Creek near Brookside Cemetery	819	37
Oxtail Creek near Glenboro	872	48
Partridge Creek near St.Martin	858	44
Pelican Creek near Birnie	838	28
Pembina River near Killarney	831	25
Pembina River near Windygates	810	37
Pleasant Valley Creek near Grandview	846	43
Pine Creek near Melbourne	843	29
Pine Creek near Pine Creek Station	835	27
Rainy Lake at Fort Frances	897	51
Rainy River near Fort Frances	898	52
Red Deer River near "The Mouth"	815	23
Red River at Emerson	818	25
Roseisle Creek near Roseisle	845	42
Seal River below Great Island	800	20
Shell River near Roblin	833	26
South Indian Lake at Missi Falls	870	64
South Indian Lake near Opachuanau	871	65
South Indian Lake at South Bay	853	62
Sturgeon River near Barwick	892	50
Turtle River near Laurier	860	45
Waterhen Lake near Skowman	857	45
Warehouse	821	38
Whitemud River above Napawa Reservoir	840	40
Whiteshell River at outlet Jessica Lake	865	46
Willow Creek near Chater	873	48

5.0 INSTALLATION OF INSTRUMENTATION AND REAL TIME EQUIPMENT

5.1 CONSTRUCTION, INSTRUMENTATION AND REAL TIME EQUIPMENT COSTS - DCP PROGRAM

This sub section details the costs associated with the 1985/86 Data Collection Platform (DCP) Installation Program. Eleven DCP systems were installed under a November 12, 1984, 5 year agreement between the Manitoba Water Resources Branch and Manitoba Hydro. The Canada-Manitoba Memorandum of Agreement - Water Quantity Surveys is the mechanism used to enable cost recovery and cost sharing for this program. Construction costs for upgrading or new construction projects necessitated by the DCP installation plan are included in Section 5.1 rather than under the regular program in Section 4.0 of this report.

5.2 OTHER INSTRUMENTATION AND REAL TIME EQUIPMENT COSTS

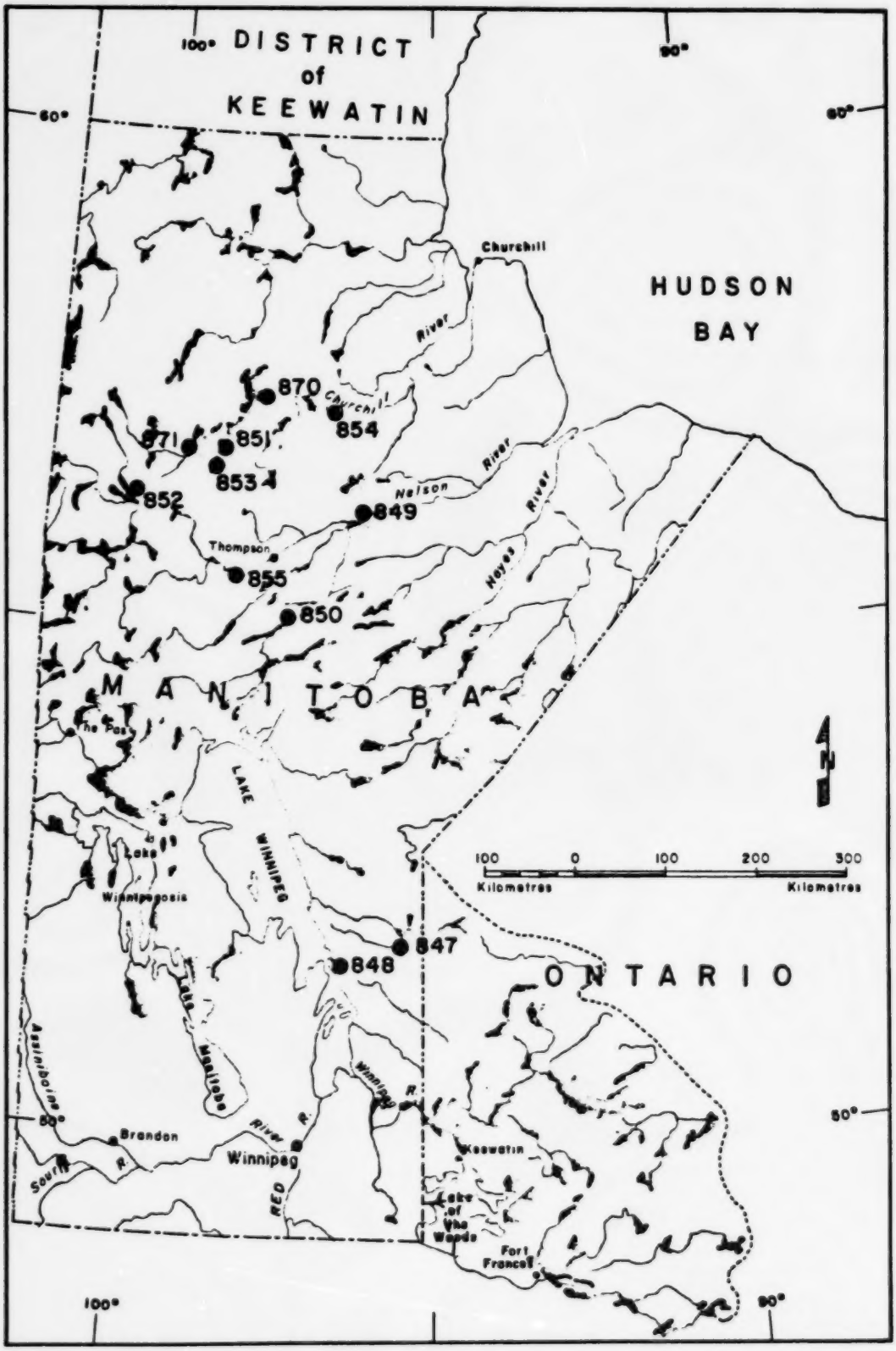
In addition to the DCP installation program (Section 5.1), additional instrumentation and real time equipment was acquired to meet regular program needs. This section identifies the equipment purchased, costs and the funding party. Included is a detailed listing of the 1985/86 DCP system components and component costs.

5.3 SUMMARY OF INSTRUMENTATION AND REAL TIME TELEMETRY COSTS

This table summarizes the 1985/86 instrumentation and telemetry costs by agency.

DCP

PROGRAM



DCP INSTALLATIONS

Project No. 847

Family Lake at Little Grand Rapids - Federal-Provincial 05RD006

Install gauge shelter, DCP System, CAE Manometer and Stevens Recorder.

Description:	A 1625 mm x 2440 mm x 2440 mm high Armco prefabricated metal building was insulated with R8 fibreglass and panelled with 6 mm hardboard. Building base constructed of 150 mm square timber anchored into ground with galvanized metal sign posts and lagged into building base. A 15 amp circuit was installed to shelter from Natural Resources warehouse. Building contains a duplex receptacle, light and switch. A Bristol Hydromet GOES DCP system, CAE Model 311 Servomanometer and Stevens recorder were installed at the site.	
Construction	Installation by District personnel on Provincial Natural Resources property.	
Construction Cost Data:	Materials and Supplies	$2,345.09
	Travel Expenses	327.40
	Aircraft Charter	1,642.00
	Salaries	1,620.00
	DCP System	7,904.00
	Manometer	3,800.00
	Recorder	2,700.00
	Total Project Cost	$20,338.49

Project No. 848

Bloodvein River above Bloodvein Bay - Federal-Provincial 05RB003

Installation of DCP system.

Description:	A Bristol Hydromet GOES DCP system and CAE Model 311 M Servomanometer, and Stevens Recorder were installed on site.	
Construction	Installation by District personnel.	
Construction Cost Data:	Aircraft Charter	$ 850.14
	DCP System	7,904.00
	Servomanometer	3,800.00
	Recorder	2,700.00
	Total Project Cost	$15,254.14

Project No. 849

Split Lake at Split Lake - Federal-Provincial 05UF003

Installation of DCP system.

Description:	A Bristol Hydromet GOES DCP system was installed at the site.	
Construction	Installation by District personnel.	
Construction Cost Data:	Travel	$ 44.55
	DCP System	7,904.00
	Total Project Cost	$ 7,948.55

Project No. 850

Sipiwesk Lake at Forestry Dock - Federal-Provincial 05UD006

Installation of DCP system.

Description:	A Bristol Hydromet GOES DCP system was installed at the site.	
Construction	Installation by District personnel.	
Construction Cost Data:	Travel	$ 24.00
	Aircraft Charter	1,406.00
	DCP System	7,904.00
	Total Project Cost	$ 9,334.00

Project No. 851

Southern Indian Lake at South Indian Lake - Federal-Provincial 06EC001

Installation of DCP system.

Description:	A Bristol Hydromet GOES DCP system was installed at the site.	
Construction	Installation by District personnel.	
Construction Cost Data:	Travel	$ 100.80
	Aircraft Charter	517.50
	DCP System	7,904.00
	Total Project Cost	$ 8,522.30

Project No. 852

Granville Lake at Pickerel Narrows - Federal-Provincial 06EB002

Installation of DCP system.

Description:	A Bristol Hydromet GOES DCP system was installed at the site.	
Construction	Installation by District personnel.	
Construction Cost Data:	Travel	$ 24.00
	Aircraft Charter	1,028.10
	DCP System	7,904.00
	Total Project Cost	$ 8,956.10

Project No. 853

Southern Indian Lake at South Bay - Federal-Provincial 06EC002

Replace gauge shelter, install DCP System, CAE Manometer and Stevens recorder.

Description:	A 1625 mm square by 2440 mm high Armco metal building, with R8 fibreglass and 6 mm pannelling was set on an existing timber base. A 1370 mm diameter culvert style shelter was removed from site. A Bristol Hydromet GOES DCP system, CAE Model 311 Servomanometer and Stevens recorder were installed at the site.	
Construction	Replacement and installation by District personnel on Crown property.	
Construction Cost Data:	Materials and Supplies	$1,619.29
	Travel Expenses	1,157.11
	Salaries	1,424.00
	DCP System	7,904.00
	Manometer	3,800.00
	Recorder	2,700.00
	Total Project Cost	$18,604.40

Project No. 854

Churchill River below Fidler Lake - Federal-Provincial 06FB001

Relocate gauge shelter and install DCP system.

Description:	A 1625 mm square by 2440 mm high Armco metal building, was located approximately 1 kilometer downstream and anchored with steel flags to bedrock. The building was slung to new site by helicopter. A Bristol Hydromet GOES DCP system was installed at the site.	
Construction	Relocation by District personnel on Crown property.	
Construction Cost Data:	Materials and Supplies	$ 146.38
	Travel Expenses	402.85
	Aircraft Charter	3,035.83
	Salaries	895.00
	DCP System	7,904.00
	Total Project Cost	$12,384.06

Project No. 855

Burntwood River above Leaf Rapids - Federal-Provincial 05TE002

Relocate gauge shelter and install DCP system.

Description:	The existing Bally instrument shelter was dismantled and slung to the new site by helicopter. The shelter was erected and a Bristol Hydromet GOES DCP system was installed at the site.	
Construction	Relocation and installation by District personnel on Crown property.	
Construction Cost Data:	Travel	$ 96.00
	Aircraft Charter	2,925.90
	DCP System	7,904.00
	Total Project Cost	$10,925.90

Project No. 870

Southern Indian Lake at Missi Falls - Federal-Provincial 06EC006

Installation of gauge shelter, DCP system, CAE Manometer and Stevens recorder.

Description:	A 1780 mm square by 2290 mm high Bally prefabricated insulated building with 100 mm urethane insulated walls, ceiling and floor with galvanized metal interior. Building is mounted on a 100 mm x 150 mm timber base supported on rock flag anchors grouted into the bedrock. A Bristol Hydromet GOES DCP system, CAE Manometer and Stevens Recorder were installed at the site.	
Construction	Installation by District personnel on Crown property.	
Construction Cost Data:	Materials and Supplies	$3,229.60
	Travel Expenses	540.05
	Aircraft Charter	2,037.50
	DCP System	7,904.00
	Salaries	925.00
	Manometer	3,800.00
	Recorder	2,700.00
	Total Project Cost	$21,136.15

NOTE: Bally building was salvaged from Churchill River Diversion at South Bay (06EC002).

Project No. 871

Southern Indian Lake near Opachuanau Lake - Provincial 06EC007

Install gauge shelter DCP system, CAE Manometer and Stevens recorder.

Description:	A 1780 mm square by 2290 mm high Bally prefabricated building with 100 mm urethane insulated walls, ceiling and floor with galvanized metal interior, mounted on a 150 mm x 150 mm base and post set in soil. A Bristol hydromet GOES DCP system, CAE manometer and Stevens recorder were installed at the site.	
Construction	Installation by District personnel on Crown property.	
Construction Cost Data:	Materials and Supplies	$3,000.22
	Travel Expenses	$ 576.56
	Aircraft Charter	$3,467.50
	Salaries	$1,439.00
	DCP System	$7,904.00
	Manometer	$3,800.00
	Recorder	$2,700.00
	Total Project Cost	$22,887.28

5.2 OTHER INSTRUMENTATION AND REAL TIME EQUIPMENT COSTS

Manitoba Water Resources Branch	
(a) One complete Data Collection Platform Package	$7,904.00
Lake of the Woods Control Board	
(a) Three complete Data Collection Platform Packages	23,712.00
(b) One CAE model 311 servomanometer	3,984.20
(c) One Belfort 5915 - 300 mm precipitation gauge	2,275.40
	$29,971.60
Canada Water Resources Branch	
(a) Three Telemark II's	$6,594.00

1985-86

DATA COLLECTION PLATFORM PACKAGE

$5,335.00	1 ea	Hydromet DCP
736.47	1 ea	Encoder c/w drive gear
1,064.53	1 ea	Memomark III
-	1 ea	Remote Terminal Strip
-	1 ea	Antennae
370.00	1 ea	Solar Panel c/w mounting bracket, regulator, 2 5/16" U-Bolts
96.00	1 ea	Battery, 12 V, wet cell, c/w battery clamps
	1 ea	Power cable (battery to DCP)
	1 ea	Antennae Cable (Antennae to DCP)
	1 ea	Cable (encloder to memomark)
	1 ea	Harness wire (terminal board to DCP)
	1 rl	Solar Panel Wire, 15'
	1 rl	Ground wire, bare copper, 15'
	1 ea	Antennae Mounting Bracket c/w (4 ea. 1/4 x 3/4 FH Stove Bolts, 2 ea. 5/16" x 2" U-Bolst)
302.00	1 ea	2" x 36" Galvanized Pipe Mast
	1 ea	2" Galvanized Floor Flange
	1 ea	18" x 15 3/4" Plywood mast mounting Board c/w (4 ea. 3/8" x 2" Hex Head Bolts for mounting to shelter)
	1 ea	Ground Rod
	1 ea	Copper Ground Strap to 2" mast
	1 pkg.	Nylon Cable Ties
	1 pkg.	Duct Seal
	1 each	Recorder event counter kit (magnet, switch, 10' wire)
	1 each	1 amp fuse and inline fuse holder for servo line
	1 each	10 watt 50 ohm resistor for servo line

$7,904.00 per DCP System

5.3 SUMMARY OF INSTRUMENTATION AND REAL TIME TELEMETRY COSTS

Manitoba

Canada Water Resources Branch

5 water level recorders	$13,500.00
1-1/2 servomanometers	5,700.00
4-1/2 DCP system packages	35,568.00
3 Telemark II's	6,594.00
installation costs	10,815.97
	$72,177.97

Manitoba Water Resources Branch

1-1/2 servomanometers	$ 5,700.00
1 DCP system package	7,904.00
	$13,604.00

Manitoba Hydro

2 servomanometers	$ 7,600.00
6-1/2 DCP system packages	51,376.00
Installation costs	26,031.40
	$85,007.40

TOTAL MANITOBA	$170,789.37

Ontario

Lake of the Woods Control Board

3 DCP system packages	$23,712.00
1 Servomanometer	3,984.20
1 Belfort 5915-300 mm	2,275.40
TOTAL ONTARIO	$29,971.60
DISTRICT TOTAL	$200,760.97

APPENDIX A

CONSTRUCTION METHODS AND PROCEDURES

BANK INSTALLATIONS

In-bank installations are handled by private contractor on tender, or by District staff. Generally those requiring a well depth greater than 4.8 m are handled by contractor, who will supply all materials (except Armco building) and all labour. Construction staff is on site to assure intake pipes and back fill are properly installed.

If construction is done by own staff, then the 16 gauge, 1200 mm diameter galvanized corrugate metal pipe, complete with riser pipes and flush valves, is purchased on tender from private supplier. Backhoe and operators are hired by service contract to perform necessary excavation. When excavation is complete, stilling well is installed and a well tieback system is attached. The lower intake pipe and heating cables are installed at this time. Back fill and compaction proceed until elevations of other intake pipes are reached and installed. When back fill is complete, the building support system and floor are fastened to the well.

The 1625 mm x 1625 mm x 2440 mm high Armco metal shelter is then erected and insulated on site. Insulation generally consists of R-8 fibreglass batts covered with 6 mm hardboard panelling.

If hyro is readily available, then service contracts are issued for extension of 110/220 single phase 60 amp service to gauge shelter.

PRESSURE INSTALLATIONS

The foundation or support system for this type of structure is either 150 mm thick reinforced concrete floor set on concrete piles or a timber base set on 4 - 150 mm timbers set 900 mm into the ground. The Armco or Bally building is then erected on site. Armco buildings are then insulated and panelled.

The pressure line is installed under ground through the floor of shelter to an orifice block installed in the river. This line is either threaded through a flexible metal conduit or 51 mm plastic pipe buried in ground to prevent vandalism.

FUNCTIONAL INSTALLATION

Generally consists of 400 mm diameter, 16 gauge, galvanized, corrugated metal pipe attached to a wing wall, pile or pier or a bridge.

The stilling well can either be a plain piece of culvert, have a 3 mm plate welded over bottom end, have 38 mm intake pipes, have a clean out door, or a combination of all of the above, depending upon stream characteristics.

These structures are usually installed by dumping culvert on stream bed or ice, jockeying one end of well into approximate position at stream bed and raising the other end to its position at bridge deck by using a come-a-long. The well is then plumbed and fastened in place by straps and threaded rod or by stud bolts and angle iron on concrete structures.

A 730 mm x 915 mm "California" steel plate shelter is then attached to upper end of culvert to house A35 recorder.

CABLEWAYS

A-frames, fabricated to standard plans, have legs of 100 mm diameter galvanized steel pipes in sizes 1.83 m to 4.88 m with support arms for aircraft warning marker cables.

Wide flange section 150 mm x 150 mm galvanized steel with hinged base have been used for cableways higher than 5.0 metres.

Supports for short cableways may be of 200 mm x 200 mm wide flange

galvanized steel sections, free standing, set in 600 mm diameter concrete base in depths at least equal to the above ground height of cable support. The main cable is then tensioned by 600 mm long threaded U-bolts at each cableway support.

i) Cables

Main cable is 19 mm to 25 mm, 6 x 19 wire rope, galvanized fibrecore improved plough steel or 29 mm, 1 x 19 tramway track strand with spelter sockets. Tie backs and aircraft warning marker cable are 10 mm or 13 mm, 6 x 19 wire rope, galvanized mild plough steel.

ii) Anchorages

Steel reinforced concrete deadman 2400 mm x 1800 mm x 1400 mm deep with 32 mm diameter, galvanized steel main anchor bar and 16 mm diameter galvanized steel tiebacks and erection bars.

Where bedrock exists, 25 mm diameter rock pins are grouted into holes drilled in the bedrock. Two rock pins and axle for the main cable and one rock pin for the back stay.

iii) Pedestals

Steel reinforced concrete is poured into sonotube forms 450 mm in diameter by 1200 mm deep. Pedestal bolts anchor the A-frame to the pedestals.

iv) Turnbuckles

Drop-forged galvanized 38 mm x 609 mm turnbuckles are used to attach and regulate the sag of the main cable to the anchorage. Crosby clips and thimbles are the standard accessories.

v) Aircraft Warning Markers

Fibreglass bells 760 mm diameter by 760 mm deep, international orange are standard.

vi) Cable-car Platforms

65 mm x 65 mm x 6 mm angle iron, bolted to A-frame and fitted with Armco Interlocking Grating for deck and dexion safety railing.

viii) Detached Platform

Legs are 76 mm diameter galvanized pipe with 65 mm x 65 mm x 6 mm galvanized angle iron frame, mounted on concrete pedestals. Armco Grating deck, safety railing and metal access ladder are part of standard design.

ix) Electrical

Walk-in gauge shelters are wired for 60 amp electrical service. This includes 3 duplex receptacles, each on separate circuits and one overhead light on a switch. Heat tapes are wired directly into thermostats or toggle switches.

Functional gauge structures are supplied with 30 amp service. One duplex receptacle is used on two circuits. A 150 mm x 150 mm service pole with service panel and mast is located on high ground near gauge.

APPENDIX B

SALVAGED MATERIALS

This section is a listing of all salvaged materials from Federal, Federal-Provincial and Provincial stations. The list is cumulative from year to year with reused materials dropped from list in subsequent years. CWRB has stored and labelled all salvaged materials.

Footnotes on appropriate projects describe material salvaged or reused for that particular project.

Materials salvaged from a station of one category (P) and reused at a station of another category (F-P) are identified by a footnote to the list.

SALVAGED MATERIALS

Material	Source			Re-Use	
	Station No.	Year Const'd.	Category At Const'n	Station No.	Category
1983-84					
460 mm dia x 4.25 m culvert	050G021	1971	F	05LL013	F-P*
460 mm dia x 5.5 m culvert	050D027	1971	F		
530 mm dia x 4.0 m culvert	05LJ031	1973	F		
530 mm dia x 4.9 m culvert	050A014	1972	F		
"California" shelter"	05LJ031	1973	F		
"California" shelter"	050A014	1972	F		
Steel Plate shelter	050G021	1971	F		
1625 Armco Bldg.	05MG004	1967	F		
1200 mm dia x 4.25 m stilling well	05MG010	1967	F		
381 mm dia x 4.25 m culvert	05LL008	1978	F-P	05LM002	F-P
460 mm dia x 3.6 m culvert	05LJ015	1977	F-P	05PJ001	F-P
460 mm dia x 1.5 m culvert	05NG009	1979	F-P		
460 mm dia x 3.6 m culvert	05LJ046	1977	F-P	05LG046	F-P
460 mm dia x 3.0 m culvert	05LJ046	1977	F-P	05Qb007	F*
"California" shelter	05LL008	1978	F-P		
"California" shelter	05LJ015	1977	F-P		
"California" shelter	05NG009	1979	F-P		
"Calfironia" shelter	05LJ046	1977	F-P		
1984-85					
381mm dia. x 3.0 m culvert	050C025	1980	F		
360 mm dia x 3.6 m culvert	050J016	1971	F	05QB007	F
"California" shelter	050J016	1971	F		
1200 mm dia x 3.6 m stilling well	05LD001	1970	F		
1370 mm dia. CSP shelter	05LD001	1970	F		
1625 mm Armco Bldg.	05KH008	unknown	F		
1780 mm Bally Bldg.	06EC002	1977	F	06EC006	P
1780 mm Bally Bldg.	05TF003	1977	F	Parts Only	
1625 mm Armco Bldg.	05TB003	1979	F-P		
1625 mm Armco Bldg.	05TA002	1981	P		
122 m - 25 mm dia wire rope	050C001	1967	F		
1985-86					
1625 mm Butler Bldg.	05LM002	1973	F	05LM008	F-P
1370 mm dia. CSP Shelter	05LM008	1980	F-P		

* Culverts in category F used in F-P, traded for F-P used in F